NATURAL RESOURCES CONSERVATION SERVICE

CONSTRUCTION SPECIFICATIONS

GRADE STABILIZATION STRUCTURE

1. Scope

The work shall consist of all construction operations and furnishing all materials as required by the drawings and specifications for the complete installation of the works.

2. Location

The location of the structure, embankment, channel excavation, and auxiliary spillway shall be as specified on the drawings.

3. Site Preparation

The area shall be cleared of all trees, logs, stumps, roots, boulders, sod, and rubbish. Topsoil containing substantial amounts of organic matter shall be stockpiled for later placement on the embankment.

Waste material such as rocks, frozen soil, mud, stumps, trees, logs, roots, or rubbish shall be disposed of by piling, burying, or burning at locations outside the embankment area or as directed by the inspector.

Burning shall comply with all state and local policies pertaining to open burning.

4. Excavation

To the extent they are suitable and approved by the inspector, excavated materials are to be used as fill materials. Excess material shall be placed at locations shown on the drawings or as directed by the inspector.

Excavated surfaces against which earthfill or concrete is to be placed shall be preserved in the most sound condition possible and protected from drying that may cause the formation of shrinkage cracks.

The completed work shall conform to the lines, grades, and elevations shown on the drawings or as staked in the field.

5. Concrete

Concrete shall have a minimum design strength of 3000 psi at 28 days with a maximum net water content of 6.5 gallons/bag.

Portland cement shall be Type I or II. Air-entraining admixture shall be used to provide an air content of 5 to 8 percent of the volume of concrete.

Coarse aggregate shall be hard; be free from dirt and organic materials; and consist of well-graded gravel, crushed stone, or other suitable materials larger than 3/8 inch. Maximum size shall be 1 inch.

Fine aggregate shall consist of well-graded natural or manufactured sand with particle gradation ranging from coarse (3/8 inch) to fine (#200 sieve).

Mixing water shall be clean and free from oil, alkali, or acid.

The proportions of the aggregates shall be such to produce a concrete mixture that will work readily into the corners and angles of the forms and around steel reinforcement when consolidated. The slump at the time of placing shall be 3 to 5 inches.

Forms shall be wood, plywood, steel, or other approved materials and shall be mortar-tight. The forms shall be unyielding and shall be constructed so the finished concrete conforms to the specified dimensions and contours.

Prior to placement of concrete, the forms and subgrade shall be free of chips, sawdust, debris, water, ice, snow, extraneous oil, mortar, or other harmful substances or coatings.

Inspection and approval of the forms and steel placement by designated personnel shall be made prior to the placement of concrete. Copies of the concrete delivery tickets shall also be furnished to verify proper concrete was delivered and placed.

Concrete shall be conveyed from the mixer to the forms as rapidly as practical by methods that will prevent segregation of the aggregates and loss of mortar. Concrete shall not be dropped more than 5 feet vertically except where suitable equipment is used to prevent segregation.

Immediately after the concrete is placed in the forms, it shall be consolidated by spading, hand tamping, or vibration as necessary to ensure smooth surfaces and dense concrete.

Forms shall be removed in such a way to prevent damage to the concrete.

The minimum period from completion of the concrete placement to the removal of the forms shall be 12 hours.

All exposed surfaces of the concrete shall be accurately screeded to grade and then wood-floated.

Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period or until curing compound is applied.

Concrete shall not be mixed nor placed when the atmospheric temperature is less than 40^{o} F or more than 90^{o} F unless facilities are provided to prevent freezing or for cooling as required.

If concrete is placed when temperatures may fall below 40^{o} F during the curing period, it will be insulated or heated to maintain a temperature of 50^{o} F for the first 3 days of the curing period.

6. Reinforcing Steel

Grade 40 or 60 reinforcing steel shall be standard, deformed reinforcing bars of the size indicated in the plans.

Before reinforcement is placed, the surface of the bars and any metal supports shall be cleaned to remove any rust, mill scale, oil, grease, or other coatings and shall be maintained in such a condition until it is completely embedded in concrete.

Reinforcement steel shall be accurately placed and supported in such a manner that will prevent its displacement during the placement of the concrete. Tack welding of bars will not be permitted. Metal chairs, metal hangers, metal spacers, and concrete chairs may be used to support the reinforcement. Such hangers, spacers, and ties shall be placed in such a manner that they will not be exposed in any concrete surface. Precast concrete chairs shall be moist at the time concrete is placed.

Welded wire fabric shall conform to the requirements of American Society for Testing and Materials (ASTM) A 185. All joints are to be double reinforced by laps of 15 inches or more.

7. Expansion Joints

Expansion joints shall be made only at locations shown on the drawings. Expansion joint filler shall be held firmly in the correct position as the concrete is placed.

Expansion joint filler shall conform to the requirements of ASTM Specification D 1752, Type I, Type II, or Type III.

8. Foundation Drain

Drainfill shall be sand and gravel or crushed stone which ranges in size, as described for fine aggregate meeting ASTM C 33 and shall be selected to avoid the inclusion of organic matter, clay balls, excessive fine particles, or other substances that would interfere with its free-draining properties.

When the drainfill is placed, foundation surfaces shall be free and clean of organic matter, loose soil, foreign substances, and standing water.

The drainfill shall be placed to the lines and grades shown on the drawings. No compaction will be required beyond that resulting from the placing and spreading operations.

Weep holes shall use Schedule 40 PVC pipe meeting ASTM D 1785 requirements.

9. Bedding Materials

Bedding material shall be used to level the foundation excavation to finished grade, allowing for the placement of concrete. Use of moist (not saturated) bedding material will facilitate screeding, leveling, and finishing operations.

Bedding material shall be placed to a thickness of 3 to 6 inches, as necessary, over the entire area to be covered by concrete.

Bedding material shall consist of clean sand, gravel and/or crushed rock which ranges in size from concrete sand (ASTM C 33) to gravel or crushed rock no larger than 3/8 inch. Material shall be uniformly graded.

10. Geotextile

Refer to Section 15, "Material Specifications for Geotextiles, Nonwoven," for required filter fabric properties.

Place filter fabric on sides and below drainfill material as shown on the drawings.

Fabric placement for weep hole drains and rock riprap shall be as indicated on the drawings.

Place filter fabric over and outside of entire area of bedding material when using concrete blocks for inlet or outlet protection. The fabric shall be loosely laid (not stretched) such that it will conform to any minor surface irregularities. No cuts or punctures in the fabric will be permitted. Fabric edges should extend at least 12 inches past the edges of the bedding material. Use a minimum lap of 24 inches if the filter fabric is installed in more than one piece. The length of the fabric shall be placed parallel to the direction of water flow unless otherwise indicated on the drawings.

Place excess fabric in a trench along all edges of bedding material and backfill or anchor with soil. The fabric shall be anchored to a minimum depth of 12 inches into the trench.

Place no bedding material or soil on top of the filter fabric and under concrete blocks. The fabric shall not be left exposed for more than 48 hours.

11. Placement of Earthfill

The foundation area shall be scarified to a minimum depth of 4 inches before the fill material is placed and moisture is added, if necessary, so that the first layer of fill material can be bonded to the foundation. The material placed in the fill shall be free of sod, roots, frozen soil, stones over 6 inches in diameter, and other objectionable material.

The distribution and gradation of materials shall be such that there will be no lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material.

The completed work shall conform to the lines, grades, and elevations shown on the drawings or as staked in the field.

Topsoil strippings will be placed on the outer portion of the embankment as a part of each lift. Topsoil shall not be less than 6 inches nor more than 2 feet thick (measured vertically) and shall be compacted concurrently with the earthfill.

Hand-Compacted Backfill - Selected impervious backfill material shall be placed against structure surfaces in layers not more than 4 inches thick before compaction; and each layer shall be thoroughly compacted by hand tamping, manually directed power tampers, or plate vibrators to the density of the surrounding material. The height of fill shall be increased at approximately the same rate on all sides of the structure. Heavy equipment shall not be operated within 2 feet of the structure.

12. Moisture Control

The moisture content of the fill material shall be such that the required compaction can be obtained. Material that is too wet shall be dried to meet this requirement, and material that is too dry shall have water mixed until the requirement is met. Moisture requirements will be as shown on the drawings or in Section 16, "Construction Details," of this specification.

13. Rock Riprap

The rock shall be dense; sound; and free from cracks, seams, or other defects conducive to accelerated weathering. The rock fragments shall be angular to sub-rounded in shape with the least dimensions not less than 1/3 the greatest dimension of the fragment.

The subgrade surfaces on which the riprap is to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. The rock shall be placed to the depths specified. The riprap shall be constructed to the fill course thickness in one operation and in such a manner as to avoid serious displacement of the underlying materials. The rock in place shall be reasonably homogeneous with the larger rocks uniformly distributed and firmly in contact one to another and with the smaller rocks filling the voids.

Hand placing will be required to the extent necessary to prevent damage to the structure.

Gradation requirements of the rock riprap will be as shown on the drawings or as specified in Section 16, "Construction Details," of this specification.

14. Vegetation

A protective cover of vegetation shall be established on all earth surfaces in the construction area that have been altered or disturbed by the construction operation. Seedbed preparation, seeding, fertilizing, and mulching shall comply with Construction Specifications 342, Critical Area Planting.

15. Material Specifications for Geotextiles, Nonwoven

Geotextiles shall be manufactured from randomly oriented synthetic long chain or continuous polymeric filaments or yarns (such as polypropylene, polyethylene, polyester, polyamide, or polyvinylidene-chloride) bonded together by the needle-punched process. In addition, one side may be slightly heat-bonded. The geotextile shall be formed into a stable network of filaments or yarns that retain their relative position to each other; are inert to commonly encountered chemicals; and are resistant to ultraviolet light, heat, hydrocarbons, mildew, rodents, and insects. The geotextile shall be free of any chemical treatment or coating that might significantly reduce its permeability and shall have no flaws or defects that significantly alter its physical properties.

The geotextile shall be shipped in rolls wrapped with a protective covering to keep out mud, dirt, dust, debris, and direct sunlight. Each roll of geotextile shall be clearly marked to identify the brand, type, and the individual production run.

The geotextile shall meet the requirements specified in Table 1. Product properties as listed in the "Product Reference Guide and Directory" from the specifier's current annual Geotechnical Fabrics Report will be acceptable documentation that the product style or type meets these specified requirements. For products that do not appear in the referenced directory, typical test data from the identified production run of the fabric will be required for each of the tests specified in Table 1.

16. Construction Details

Inspection - Inspection and approval of the forms and steel placement by NRCS personnel (inspector) shall be made prior to the placement of concrete. Copies of the concrete delivery tickets shall be furnished to the inspector.

Table 1 - Requirements for Nonwoven Geotextiles
Used with base soils classified as CL, CH, ML, MH, SC or GC and PI > 10

Property	Test Method	Property Value
Tensile Strength - lbs. [1/]	ASTM D 4632 Grab test method	120 min.
Bursting Strength - psi [1/]	ASTM D 3786 Diaphragm tester	210 min.
Elongation - % at breaking load [1/]	ASTM D 4632 Grab test method	> 50
Puncture - lbs. [1/]	ASTM D 4833	60 min.
Ultraviolet Light Resistance	ASTM D 4355 150 hours exposure	70% tensile strength retained
Apparent Opening size (AOS)	ASTM D 4751	#70 Maximum [2/]
Permittivity - (sec 1)	ASTM D 4491	0.70

[1/] Minimum average roll value (weakest principal direction)

[2/] U.S. standard sieve size - To meet this requirement, the AOS must have a value greater than or equal to 70, which indicates opening sizes less than or equal to a #70 sieve.